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MORTALITY AND CAUSE OF DEATH IN ABUTH, ZARIA: 1999 – 2005

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ABSTRACT

Background: **Accurate mortality statistics are needed for policy formulation, implementation and monitoring of health intervention that are aimed at improving the health status of the people. Mortality level is one of the indicators of the quality of life and status of health of a population. However, accurate collection, collation, analysis and interpretation of such data is poorly organised in developing nations, including Nigeria leading to a gap in health policy formulation, implementation and monitoring. Therefore, policies and strategies for disease prevention are based on empirical evidence rather than on data primarily collected to formulate disease specific interventions. Though, hospital data have inherent deficiency in its use to design prevention. However, when accurately generated and adequately managed would provide both qualitative and quantitative information on morbidity and mortality if not for the entire society at least for a segment of the population utilizing it. We implemented a system of death certification to determine causes and pattern of mortality in Ahmadu Bello University Teaching Hospital, Zaria**

Methods: **From May 1999 to November 2005, all case folders of deceased patients were retrieved from the central library of health information management department of the hospital; case folders of deceased patients are required to have in them a completed IFMCCD (International Form of Medical Certification of Cause of Death). All case folders of deceased patients after relevant information were extracted by the staff of health management information department, were passed on to the staff of department of Community Medicine directly involved in this study. The completed cause of death certificates received in the department of Community Medicine (between May 1999 and November 2005), were examined. Coding rules were employed to select the appropriate code for those certificates that were incorrectly completed. The underlying cause of death as identified from the correctly completed IFMCCDS is coded according to ICD-10.**

Results: **For the period under study, there were 4019 deaths: 2212 males and 1807 females. Total of 2914 (72.5%) deaths were certified, using the IFMCCD of which 1641 of them were males and 1273 females and formed the basis of this analysis. Coverage rates ranges from 56.2% in 2001 to 85% in 1999. The proportion of garbage codes ranges from 0% to 2.4% while the three leading causes of death are HIV infection, road traffic accident (RTA), and cardiovascular diseases among the ten. The time-trend of the leading causes of death show RTA maintaining steady upward climb while malaria, septicemia, PEM, sepsis in the neonatal period shows unsteady fluctuation.**

Conclusion: **This study assessed the pattern of mortality and causes of death in ABU Teaching Hospital, Zaria; it also provided information on leading causes of death.**

INTRODUCTION

Information on causes of death is scanty in many developing countries including Nigeria[1]. Though there has been a law in this country establishing a nationwide vital registration system, it has failed to gain enough momentum to ensure a reasonably adequate coverage mainly due to lack of necessary official support, patronage and enforcement of provision of the law[2].

It is needless to stress the fact that health research is dependent on information collection, analysis and interpretation. Whereas analysis and interpretation is pro-

fessional expertise, information is generated from a variety of sources. For health information, the principal sources are the official system of civil registration of vital events and all the health care delivery agencies, private and public catering for the needs of the community they serve. Of all these agencies, apart from the civil registration of vital events, the teaching hospital assumes the role of prime mover especially in developing countries as ours where none of the sources is able to provide even a modicum of data of utility. In such despairing state of health information of this country, a research worker or a health service administrator or a health planner rely heavily on hospital data. In a developing country like Nigeria, despite all these limitations, hospital especially university teaching hospital constitutes a very reliable source of data, if not in all accounts, at least in term of diagnostic description of mortality and morbidity. Hospital records accurately generated and adequately managed would provide both qualitative and quantitative information of mortality and morbidity if not for the entire society, at least for a segment of population utilizing it. Analysis of hospital statistics with realistic assumptions and careful circumspection of the conditions that may distort them may bring forth useful inputs to formulating strategies and setting up priorities not only in the internal management and administration of the hospital but also to a greater extent in organizing health care machinery for the community at large.

This study was designed to provide an insight into mortality pattern of a teaching hospital in the heart of Northern Nigeria that initially served the entire former Northern Region of the country and at the same time to shed more light on what is probably the pattern of mortality in the larger community. It is to be noted that similar hospital-based studies were conducted in some teaching hospitals in the 1960s[3], 1970s[4,5] and 1980s[6]. This study is the first of its kind in ABUTH, Zaria. Furthermore, the study aims at analyzing the cause-of-death statistics in order to:

1. Determine the pattern of mortality and causes of death in ABUTH, Zaria.
2. Identify the leading causes of death in ABUTH, Zaria.
3. Expose the time trend, if any, of a particular condition.
4. Delineate differential mortality from any specified cause between subgroups of inpatients.

MATERIALS AND METHODS

The Ahmad Bello University Teaching Hospital, Zaria was established in 1967 to serve the then newly established medical school, i.e. Ahmadu Bello University (A.B.U), and the entire northern Nigeria. Its services were coordinated by an Institute of Health under Ahmadu Bello University, Zaria, by the ABU Law; Statute 15.It is a complex consisting of teaching hospitals located at Zaria, the administrative headquarters with 490 beds capacity, Kaduna, the then headquarters of northern Nigeria with bed capacity of 560 and Malumfashi with 130 beds and Dala-Kano. Furthermore, there are three primary health centres running under the Department of Community Medicine.

Year	Male	Female	Total
1999	334	259	593
2000	400	233	633
2001	468	232	700
2002	349	399	748
2003	236	266	502
2004	141	207	348
2005	284	211	495
Total	2212	1807	4019

Table 1. Total deaths occurred in ABUTH, May 1999 – November 2005.

In 1975, the Federal Government took over all regional universities and their teaching hospitals. This resulted in the transfer of Institute of Health to the Federal Ministry of Health, which was subsequently transformed into Ahmadu Bello University Teaching Hospital (ABUTH) by the Federal Government's Decree 10 of 1985.The recent transformation is the closure of its satellites hospitals at Kaduna and Malumfashi and the official relocation to its new permanent site at Shika, near Zaria on November 11, 2005. As a teaching hospital, it runs training programmes for both medical doctors and paramedical personnel in medical laboratory technology, biomedical engineering, medical records administration, nursing and midwifery, and community health officers training. It has 14 clinical departments and 2 clinical units.

Year	Male	Female	Total
1999	277	227	504
2000	254	125	379
2001	275	118	393
2002	318	264	582
2003	200	220	420
2004	101	151	252
2005	216	168	384
Total	1641	1273	2914

Table 2. Total deaths analysed by sex at ABUTH, May 1999- November, 2005.

With the official relocation of the hospital to its permanent site, new equipments were installed to

provide wide range of services hitherto not offered and also designated as a Center of Excellence for Radiotherapy & Oncology.

In 1999, the Department of Community Medicine got approval and support to introduce a programme on correct certification of cause of death. Before this time medical certification of cause of death was left to the hands of inexperienced house officers; and even the medical officers had no formal training in correct certification of cause of death using the international form of medical certification of cause of death (IFMCCD) as recommended by the WHO. To this end, the department of Community Medicine in tandem with Health Management Information (HMI) department of the hospital organized a one-day training workshop for all the medical doctors, nurses and staff of HMI department. For this purpose, a handbook on medical certification of cause of death was prepared for the physicians and distributed among them. This book describes in simple language how to fill in IFMCCD and the precaution and care to be taken to ensure correct certification.

From May 1999, all case folders of deceased patients were required to have in them a filled IFMCCD. Any case folder of a deceased patient without a copy of the certificate necessitates a reminder to the attending physician for his compliance. All case folders of deceased patients after relevant information were extracted by the staff of HMI Department were passed on to the staff of department of Community Medicine directly involved in this study. The completed cause-of-death certificates received in the department of Community Medicine (since May 1999) were examined. Coding rules were employed to select the appropriate code for those certificates that were incorrectly completed. The underlying cause of death as identified from the correctly completed IFMCCDS is coded according to ICD-10[7]. The framework for analysis is based on the causes of death classification as contained in ICD-10. The ICD-10 has causes of death organized into twenty-one chapters. Of recent, the twenty-one chapters of the ICD-10 have been divided into three categories-communicable, maternal, Perinatal and nutritional conditions (Group I), non-communicable diseases (Group II) and injuries (Group III). Each group is further subdivided into a limited set of major causes [8]. The study period extended from May 1999 to November 2005 when admissions were stopped preparatory to the movement of the hospital to its new permanent site.

RESULTS

The detail statistics of cause-of-death that occurred in ABUTH from May 1999 to November 2005 are tabulated according to detailed classification at four-character level of ICD-10 (available on request from the authors). Table 1 gives data on the total number of deaths that occurred in the hospital during the period: 4019 deaths occurred during the period: 2212 were males and 1807 were females. Out of these deaths 2914 (i.e. about 72.5%) were certified using the IFMCCD with 1641 of them being males and 1273 being females and form the basis of this analysis (Table 2). Table 3 shows the yearly per cent coverage of deaths certified using IFMCCD. Proportion of "garbage codes" is shown in Table 4. The ten leading causes of death are given in Table 5. The yearly trend of the leading causes of death is shown in Table 6.

Year	Deaths certified	Deaths not certified	Total deaths	Percent of deaths certified (%)
1999	504	89	593	85.0
2000	379	254	633	59.9
2001	393	307	700	56.2
2002	582	166	748	77.8
2003	420	82	502	83.7
2004	252	96	348	72.4
2005	384	111	495	77.6
Total	2914	1105	4019	72.5

Table 3. Extent of coverage of medically certified cause-of-death among inpatient using IFMCCD.

DISCUSSION

Leading cause of death

The most appropriate statistical index in measuring the leading causes of hospitalized deaths is the proportional mortality ratio (PMR). It measures the relative magnitude of frequency of a cause of death over the overall mortality occurrence. It illustrates the relative burden of cause-specific mortality of the entire

Year	Garbage codes (%)
1999	1.4
2000	2.4
2001	1.5
2002	0.3
2003	0.5
2004	0
2005	0
1999 – 2005	0.9

Table 4. Proportion of 'Garbage Codes'

mortality spectrum. It does not reflect the causes of death in terms of their importance from public health point of view. However, before proceeding to analytical consideration in using the cause of death statistics it is worthwhile to probe into the reliability of the diagnostic conditions.

S/No	Underlying cause of death	PMR (%)
1	HIV Infection	9.9
2	Road traffic accident	9.5
3	Cardiovascular diseases	9.1
4	Protein energy malnutrition	8.1
5	Perinatal conditions	5.9
6	Diarrhoea diseases	5.7
7	Tuberculosis	5.4
8	Malaria	4.2
9	Acute lower respiratory tract infections	3.3
10	Diabetes mellitus	3.2
11	Measles	3.2

Table 5. Eleven leading causes of death, ABUTH 1999-2005.

The accuracy of the cause-of-death statistics depends on how adequately IFMCCDS were completed by the certifying physicians, and how correctly the reported conditions were coded in the case of ambiguous certificates where the underlying cause could not be easily identified. The rubrics ROO-R99 contain those deaths, which were inadequately certified for causes that are ill-defined conditions with *symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified.* The proportion of deaths assigned to this group (R00-R99) can be used as indicator of quality of coding of data[9]. There are a number of other ICD codes that do not give a useful underlying cause of death from policy perspective and their use in cause of death statistics compromises the usefulness of data and at the same time can be used to indicate quality of data. These "garbage codes" include deaths from injuries where the intent is not determined (ICD-10 codes Y10-Y34 and Y87.2), secondary neoplasm and neoplasm of unspecified sites (ICD-10 codes C76, C80, C97) and ill-defined cardiovascular causes (ICD-10 codes I47.2, I.49.0, I.46, I50, I51.4, I51.5, I.51.6, I.51.9, I.70.9). These insignificant small proportions of deaths attributed to undefined causes in Table 4 indicates the quality of cause-of-death statistics and lend themselves to a high degree of reliability in so far as the completion of IFMCCDs is concerned but not to the medical coding error.

Hospital data, as has been stated earlier, could not be used to derive any worthwhile indicator of community health like crude death rate, infant mortality rate or maternal mortality rate. Nevertheless, analysis of hospital data by finding each cause of death on the basis of proportional mortality ratio could be carried out if the data is assured to have complete coverage. Ranks based on the incomplete coverage may not present the reality in as much as ranking over full coverage may alter the entire ranking spectrum. However, if we assume that failure to complete IFMCCD of a dead patient is without any bias, which means the deaths with specified conditions such as cause, sex, age of the deceased are not routinely excluded, the coverage of IFMCCDS could be considered a random sample, so that the variation of PMR due to a cause could be estimated by 95% confidence interval.

From the detail cause-of-death statistics which covers the entire period from May 1999 to November 2005

S/NO.	Underlying cause of death	Rank in						
		1999	2000	2001	2002	2003	2004	2005
1.	Road traffic accident	1	1	1	1	2	5	-
2.	Malaria	2	-	-	-	-	-	5
3.	Protein energy malnutrition	3	2	-	-	-	-	-
4.	Septicaemia	4	3	-	2	-	3	-
5.	Neonatal sepsis	-	4	-	3	-	-	-
6.	HIV infection	-	-	2	-	1	1	1
7.	Pulmonary tuberculosis	-	-	3	-	-	-	-
8.	Diabetes mellitus	-	-	4	-	-	-	-
9.	Cerebrovascular accident	-	-	5	-	-	-	-
10.	Hypertensive heart disease	-	-	-	-	3	4	-
11.	Stroke (haemorrhage)	-	-	-	-	-	2	3
12.	Measles	-	-	-	-	-	-	2
13.	Typhoid fever	-	-	-	-	-	-	4
14.	Diarrhoea disease	3	-	-	-	-	-	-

Table 6. The yearly trend of the leading causes of death, 1999-2005.

and based on PMR, conditions which emerged as leading causes-of-death are given rank and shown in Table 5. The information in table 5 is also depicted in Figure 1. Further, using the Global Burden of Disease (GBD) framework of analysis, the data shows that group I diseases constituted the largest proportion of cause-of -death of between 47% in 2001 and 70% in 2002. Group II diseases caused about 23% in 2000 and 40% in 2001 while group III caused between just 4% in 2005 and 22% in 2000. For the entire period, group I, group II and group III diseases contributed 60%, 28% and 12% of causes-of-death respectively (Figure 2). This mortality spectrum is typical of a developing country where infections and parasitic infestations are still the leading causes of death[8].

Time-trend of leading causes of death

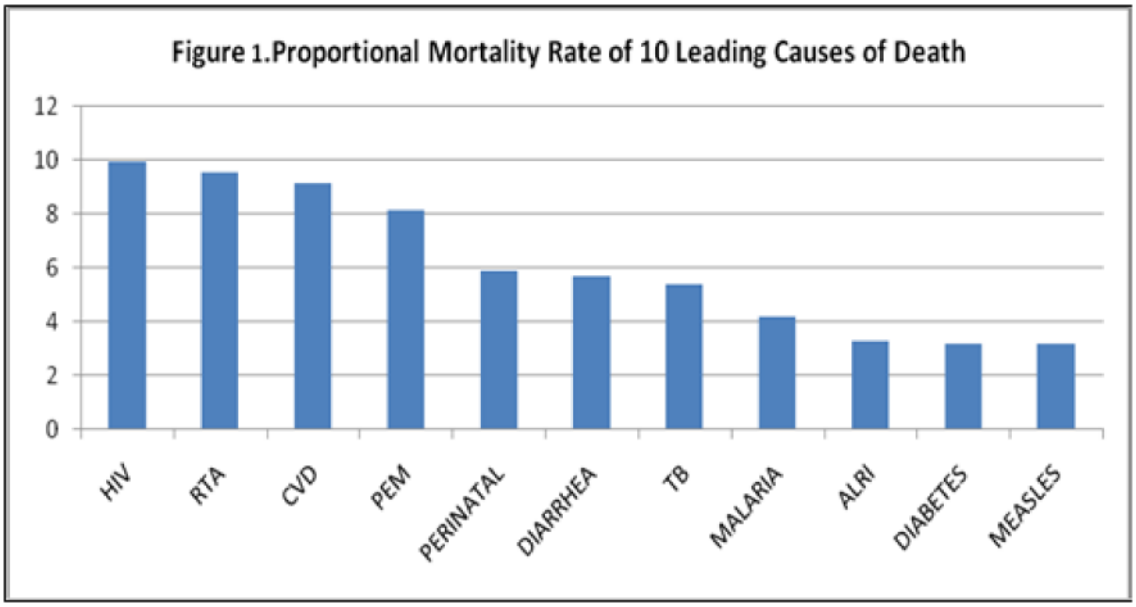
The statistics of cause-of-death are analyzed to provide the evidence of likely trend of any of these leading causes of death. For the purpose of studying trend, only the causes having PMR over 2% are captured and classified into two groups: group I contains the causes having PMR of 5.0% and over and group II between 2.0 and 4.9%. The relative change in position of a particular cause from one group to the other and the relative rank occupied by this cause within a group would give a perceptible evidence of likely direction of the trend. From this angle of analysis, it is apparent from Table 6 that:

1. Road traffic accident continues to be in steady upward trend with high level of mortality, between 1999 and 2004.
2. Malaria, neonatal sepsis, protein energy malnutrition and diarrhoea diseases show unsteady fluctuation.
3. HIV infection, diabetes mellitus and hypertension and its sequelae (hypertensive heart disease, stroke) are emerging conditions assuming the status of leading causes of death. These causes of death appeared in least in two places as leading causes of death: HIV infection was leading causes of death through 2003 to 2005.

For the entire period, the relative change in position of a cause-of-death from year-to-year is also analysed and shown in Table 6. For the four years running, road transport accident has occupied the leading causes of death then waning away without even showing up among the first five in 2005.

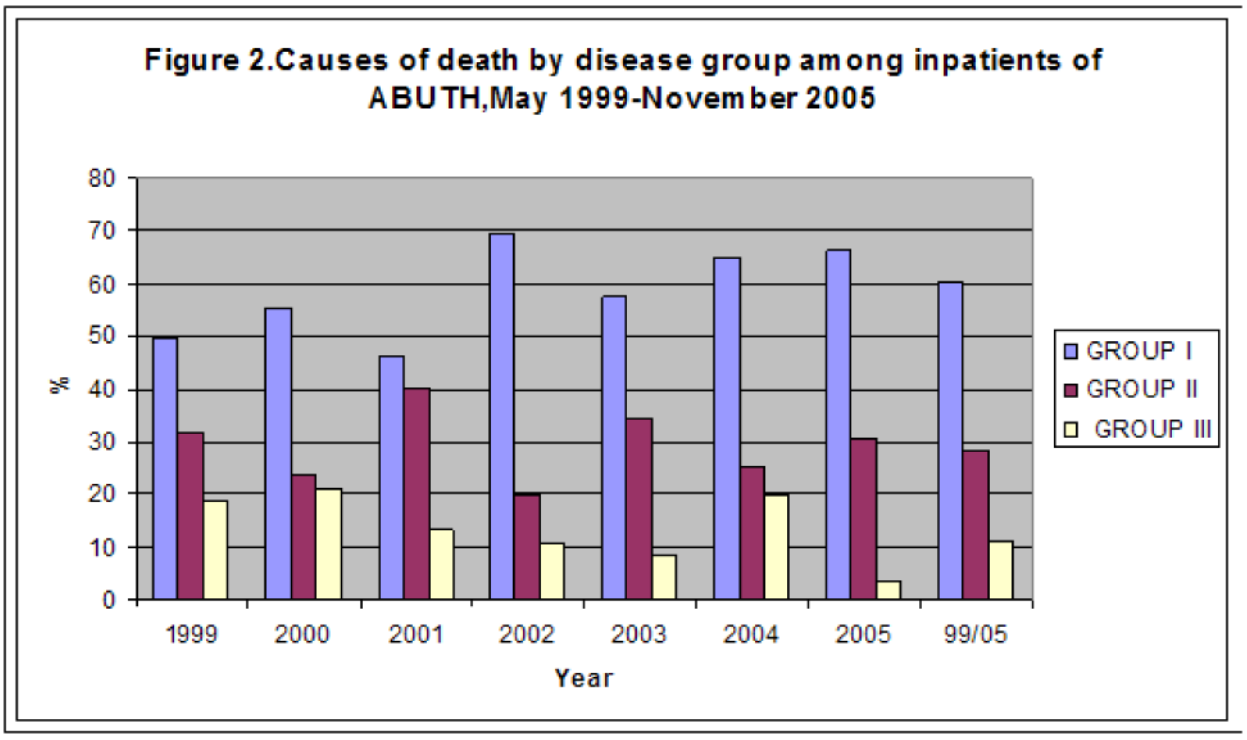
Mortality differential

Information provided in the detail statistics of cause-of-death gives causes of mortality for two subgroups of inpatients – one by age and the other by sex. As for age differential, ICD-10 specified categories of infants' deaths so also maternal deaths and deaths resulting from conditions of organ of reproduction: ovaries, cervix and endometrium. Most prominent in this category is death from carcinoma of the cervix. Again, deaths that are commonly seen among young adults and older adults are apparent from the table. Overall, a critical scrutiny of the detail statistics of cause-of-death shows some apparent picture of evidence of differentials in a few cases such as:



a. Age differentials

Septicemia (A40-A41). Septicemia is more in the extreme of ages. More than one-third (42.2%) of deaths from septicemia occurred among infants (less than 1 year) and a large proportion occurred in the age group 15-44 years. Again, septicemia is the second



leading cause of death among infants responsible for 13.5% of the deaths behind neonatal sepsis accounting for 25.0% of the deaths; measles caused the death of about 6.9% of deaths among the infants.

Diarrhoea disease (A09). Overwhelmingly, diarrhoea disease was the cause of death among children less than 5 years. It then spread out among rest of the age groups. Among those that died as a result of diarrhoea disease more than one-quarter (76%) were under 5 years.

HIV infection (B20-B24). Fully, 94% of deaths attributed to HIV occurred among those aged 15 years and above; the remaining cases occurred among those aged less than 15 years. Further to this age differential, more than 75% were in age group of 15–44 years confirming the propensity of this infection to this age group (reproductive and economic age group). Negligible number of deaths occurred among children less than 5years (1.5%) and those that died as a result of HIV infection 5.2% were less than five years old.

Malnutrition (E40-46). This is a disease of the under-fives and expectedly all but four (1.7%) deaths were among children less than 5 years. It contributed to the deaths of some 224 children under the age of five years (i.e. 22.2%).

Hypertensive diseases (I1O-I14). Prevalence of hypertension increases with advancing age, so also its sequelae such stroke, and hypertensive heart disease. All deaths due to hypertensive diseases occurred among in-patients 15years and above.

b. Sex differentials

For all causes, male deaths were considerably higher than female indicating sex differential. A close scrutiny of the data revealed an apparent sex differential with respect to road traffic accident. There were 223 (79.9%) male deaths resulting from road traffic accident compared to only 56 (20.1%) female deaths from the same cause. HIV infection as a cause of death showed expected sex differential: male and female deaths due to HIV were almost the same further confirming the infection rates among males and females in Nigeria. Causes of death with male/female ratio of almost 1:1 ratio are diabetes mellitus, malnutrition, hypertensive diseases, and neonatal sepsis. Measles had almost twice males as females, while liver carcinoma had males four times females.

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